

MARKET TREND ANALYSIS (2019-2024) OF MIXED CHEMICAL FERTILIZERS AND MICRONUTRIENT PRODUCTS IN KATHMANDU VALLEY

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ABSTRACT

In Nepal agricultural input market is observed growing basically in micronutrient fertilizers. There is no trend analysis for such inputs in recent years and thus hinders evidence-based policy making. This research was carried out to assess five-year trend analysis comparing product categories, formulation types, countries of origin, and registration status between 2019 and 2024 in Kathmandu valley. Further the objective of the study is to classify product categories and minimum nutrient specifications for policy makers. Baseline market survey was done in 2019 and documented 78 such products across the Kathmandu Valley. Again, market survey was done in 2024, and we found 218 products—a 2.9-fold increase in five years. Of 218 products surveyed across 15 agrovet in Kathmandu, Lalitpur, and Bhaktapur districts, only two (0.9%) products were found registered in Fertilizer Control Order with valid government approval. This shows the market of such product is exponentially growing.

1. INTRODUCTION

Chemical fertilizers are indispensable inputs in modern agriculture. In Nepal, their use dates to 1952, and the Government currently subsidizes and distributes the three major macronutrient fertilizers—urea (N), diammonium phosphate (DAP, P), and muriate of potash (MOP, K)—to meet approximately 60% of the country's annual active fertilizer demand (Vista et al., 2022; MoALD, 2022). While the NPK subsidy system has been relatively well-governed under the Fertilizer Control Order 2055 (1999), the private sector has increasingly filled market demand for specialty inputs: liquid fertilizers (LF), mixed micronutrient

fertilizers (MN), plant growth regulators (PGR), enzymes, hormones, vitamins, and soil conditioners.

The global micronutrient fertilizer market, valued at USD 3.8 billion in 2022, is expanding at a compound annual growth rate (CAGR) of approximately 6.8–6.9%, driven by increasing soil depletion, high-value horticulture, and precision agriculture adoption (Business Research Company, 2024; Mordor Intelligence, 2025). Asia-Pacific accounts for nearly 45% of global micronutrient fertilizer consumption, with South Asian countries—including India and Nepal—contributing significantly to this demand (Coherent MI, 2023). In Nepal

specifically, deficiencies of boron (B) and zinc (Zn) are well-documented: B deficiency affects 80–90% of agricultural soils, while Zn deficiency affects 20–50% of cultivated lands, with higher prevalence in the rice-growing Terai belt (Andersen, 2007; Shrestha et al., 2020a, 2020b). These deficiencies, if unaddressed, limit crop yields, impair nutritional quality of food, and contribute to hidden hunger (Bevis et al., 2023).

Despite clear agronomic need and rapidly growing market demand, Nepal's regulatory framework for specialty fertilizer inputs remains underdeveloped. The Fertilizer Control Order 2055 (1999) was drafted to regulate conventional solid NPK fertilizers and makes no specific provision for liquid formulations, mixed micronutrient products, PGRs, or soil conditioners. This legal vacuum has allowed hundreds of products of uncertain composition, quality, and efficacy to proliferate in the Nepali market without oversight. Earlier work by Vista and Shrestha (2019) documented 78 such products in the Kathmandu Valley market; the present (2023–2024) survey found the number had risen to 218, with only two approved by the Government.

This research was done to assess trend analysis comparing product categories, formulation types, countries of origin, and registration status between 2019 and 2024; and to proposed product classification categories and minimum nutrient specifications. Its contribution is threefold: it provides the longitudinal market trend data comparing specialty agricultural inputs in Nepal over a five-year period (2019–2024); it synthesizes international minimum nutrient specifications relevant to Nepal's context; and it proposes a concrete classification framework and labeling standards for policy makers.

2. MATERIALS AND METHODS

2.1 Comparative market survey (2019 and 2023–2024)

A baseline market survey was conducted in 2019 by Vista and Shrestha (2019), documenting 78 specialty agricultural input

products across the Kathmandu Valley. The present team conducted a follow-up survey in 2023–2024, visiting 15 agrovets across three districts: Kathmandu (5 agrovets, primarily in Kalimati), Lalitpur (5 agrovets), and Bhaktapur (5 agrovets). The two surveys used comparable methodologies, enabling longitudinal trend comparison.

For each product, we recorded: product name, product category (Liquid Fertilizer, Micronutrient, Soil Conditioner, Plant Growth Regulator, enzyme, hormone, vitamin), formulation type (liquid, granule, powder), country or district of origin, manufacturer name, package sizes, declared chemical composition and nutrient content, expiry period, registration status, application rate and method, recommended crops, application frequency, retail price per unit, and customer satisfaction rating. Data were entered into structured spreadsheets for each product and aggregated for analysis.

2.2 Manufacturing facility visits

We visited six manufacturing facilities in Bhaktapur, Bara, and Parsa districts. Semi-structured interviews explored production processes, raw material sourcing, blending practices, quality control, and marketing channels.

2.3 Review of international specifications

We reviewed minimum nutrient content standards for mixed liquid and solid fertilizers from India's Fertilizer (Control) Order 1985 (as amended through 2024), supplemented by standards from the EU (Regulation 2019/1009), Canada's CFIA micronutrient requirements (T-4-129), and the US EPA. The India FCO 1985 was treated as the primary reference given Nepal's geographic proximity, shared agro-ecology, and trade relationships.

2.4 Data analysis

Market data from both surveys were analyzed using descriptive statistics. Proportions were calculated for product category, formulation type, and country of origin to facilitate trend comparisons for the 2019–2024 period. Recommendations were developed through reviews, and informed by the survey data and international review.

3. RESULTS AND DISCUSSION

3.1 Five year market trend: 2019-2024

3.1.1 Overall market expansion

The most striking finding is the sheer scale of market growth. Between 2019 and 2024, the total number of specialty agricultural input products circulating in the Kathmandu Valley market increased from 78 to 218, a 2.9-fold increase in approximately five years (Table 1). This rapid proliferation mirrors global trends: the micronutrient fertilizer market has grown

at a CAGR of ~6.8% globally, with developing-country markets in Asia seeing accelerated growth as awareness of soil micronutrient deficiencies improves and commercial horticulture expands (Business Research Company, 2024). Nepal's peri-urban and commercial farm belt surrounding the Kathmandu Valley—characterized by intensive vegetable cultivation with high nutrient demands—appears to be a primary driver of this demand.

Table 1. Comparative market status of specialty agricultural input products in the Kathmandu Valley, 2019 vs. 2024.

Indicator	2019	2024	Change
Total products documented	78	218	+2.9×
Number of districts/agrovets	3 districts/40 agrovets	3 districts / 40 agrovets	—
Micronutrient products	35 (43%)	>131 (>60%)	+40%
PGR / Enzyme / Hormone products	35 (45%)	reduced share	↓
Soil conditioners	8 (10%)	present	—
Liquid formulation share	~67%	87% (189/218)	+20%
Powder formulations	Included	18 (8%)	—
Granule formulations	Included	11 (5%)	—
Products made in Nepal (% share)	67%	60.5%	−6.5%
No. of source countries	3	≥6	+2×
Government-approved products	7 of 35 (20%)	2 of 218 (0.9%)	↓↓
Products lacking nutrient label	0	40 (18%)	—

3.1.2 Shift in product categories

Micronutrient products dominated both surveys but increased their share from approximately 43% in 2019 to over 60% in 2024 among surveyed fertilizer basket. This shift reflects the growing adoption of zinc, boron, calcium, and iron supplements in Nepal's intensifying crop production systems, consistent with trends documented in high-value vegetable rotations where micronutrient removal rates are substantially higher than under traditional cereal systems (Shrestha et al., 2020a). The relative share of PGR/enzyme/hormone products declined proportionately, though their absolute number may have remained stable or grown.

A notable emergence in the 2024 survey was IFFCO Nano Urea—a nanotechnology-based

liquid nitrogen fertilizer approved under India's FCO 1985 in 2021 and Nepal's FCO in 2022—marking the entry of nano-fertilizer technology into Nepal's specialty input market.

3.1.3 Formulation trends

Liquid formulations dominated in both surveys and increased their share from approximately 67% in 2019 to 87% (189/218 products) in 2024. This is consistent with global specialty fertilizer trends, where water-soluble and liquid formulations are experiencing the fastest growth owing to their compatibility with fertigation and foliar application, faster plant uptake, and perceived greater efficacy by farmers (Fortune Business Insights, 2023). Powder formulations

accounted for 8% (18 products) and granules for 5% (11 products) in the 2024 survey.

3.1.4 Country of origin and domestic manufacturing

In 2019, Nepal-manufactured products constituted 67% of the market (53/78); by 2024, this share had declined to 60.5% (132/218) while the number of source countries nearly doubled—from 3 to at least 6. Products from India, China, the United States, Japan, the Netherlands, and Thailand were all represented in the 2024 survey, reflecting increasingly globalized supply chains for specialty agricultural inputs.

Facility visits revealed that most 'Nepali-manufactured' products are, in practice, repackaging or blending operations: raw materials or concentrated formulations are imported from India and China, then diluted, mixed, bottled, and labeled in Nepal. This is economically rational—raw material import tariffs are lower than finished-product tariffs—but also means that product quality depends entirely on unregulated domestic operations. However, several genuinely manufacturing-capable facilities in Bhaktapur and Bara were found to employ in-house chemists and possessed the technical capacity to produce quality-controlled formulations.

3.1.5 Registration status

The most alarming finding, consistent across both surveys, is the near-total absence of regulatory compliance. In 2019, only 7 of 35 micronutrient products (20%) had registration; by 2024, only 2 of 218 total products (0.9%) were government-approved. This deterioration in the approval rate—despite the absolute number of approved products remaining roughly stable—reflects the explosive market growth outpacing regulatory capacity. Of the 218 products, 40 (18%) did not even declare the names or quantities of nutrients on their labels, representing a basic consumer protection failure.

The root cause is structural: the FCO 2055 provides no registration pathway for these product categories. Without a legal

framework, Ministry of Agriculture and Livestock Development (MoALD) cannot grant registration, enforce standards, or penalize non-compliance. Importers and manufacturers have accordingly operated in a regulatory void, with documented adverse outcomes including products of unknown composition reaching farmers, potential phytotoxicity risks, and inability of farmers to verify product claims.

3.2 International minimum nutrient specifications

To inform proposed specifications for Nepal, the team reviewed minimum nutrient content standards from India's FCO 1985 as the primary reference, given its direct applicability to Nepal's agro-ecological and trade context.

The global consensus on micronutrient fertilizer specifications emphasizes: (i) minimum content thresholds to ensure agronomic efficacy; (ii) maximum content limits to prevent phytotoxicity; (iii) physical quality parameters (pH, viscosity, density, solubility); and (iv) mandatory pre-market laboratory certification from accredited laboratories (CFIA, 2020; EU 2019/1009; Alloway, 2008). Canada's CFIA T-4-129 specifically requires all micronutrient fertilizers to adhere to standards on content, compositional criteria, contaminant levels, and upper tolerances before being placed on the market (CFIA, 2020). These principles encouraged the research team to propose nutrient specifications for Nepal.

3.3 Proposed product classification and minimum nutrient specifications

Based on the survey findings and international review, the research team proposes the following classification system and minimum nutrient content requirements for registration under the Fertilizer Control Order 2055. Table 2 presents specifications for liquid formulations; Table 3 presents specifications for solid (granule/powder/tablet) formulations.

Table 2. Proposed minimum nutrient content requirements for liquid mixed chemical fertilizers (proposed for inclusion in FCO 2055).

SN	Formulation	Cat.	Category Description	Min. Nutrient Content (% w/v)
1	Liquid	A	Primary nutrients (N:P ₂ O ₅ : K ₂ O, sole or mixture)	20%
		B	Primary nutrients + secondary nutrients	15% primary + 5% secondary
		C	Primary nutrients + micronutrients	15% primary + 5% micronutrients
		D	Primary + secondary + micronutrients	15% primary + 5% secondary + 4% MN
		E	Secondary nutrients (mixture)	15% secondary
		F	Secondary nutrients + micronutrients	12% secondary + 4% micronutrients
		G	Micronutrients (sole or mixtures)	12% micronutrients

Note: Primary nutrients = N, P, K; Secondary nutrients = Ca, Mg, S; Micronutrients = Zn, B, Mn, Cu, Fe, Mo, Cl, Ni. N = total nitrogen (% w/v); P = total phosphorus as P₂O₅ (% w/v); K = potash as K₂O (% w/v).

Table 3. Proposed minimum nutrient content requirements for solid mixed fertilizers (granules/powder/tablets) for registration under FCO 2055.

SN	Formulation	Cat.	Category Description	Min. Nutrient Content (% w/w)
2	Soil (granules/ powder/ tablet)	A	Primary nutrients + micronutrients	10% primary + 5% micronutrients
		B	Primary nutrients + secondary nutrients	10% primary + 6% secondary
		C	Primary + secondary + micronutrients	10% primary + 6% secondary + 4% MN
		D	Secondary nutrients (mixture)	12% secondary
		E	Secondary nutrients + micronutrients	8% secondary + 4% micronutrients
		F	Micronutrients (sole or mixtures)	10% micronutrients

Note: For solid formulations, minimum content is expressed as % by weight (w/w).

3.4 Proposed mandatory labeling requirements

Labeling is the primary consumer protection mechanism for specialty fertilizer products. Based on international best practices (India FCO 1985; EU 2019/1009; CFIA T-4-129) and the market survey findings—in which 18% of products lacked any nutrient information—the research team proposes the following as mandatory label requirements for all registered mixed liquid fertilizers and micronutrient products in Nepal:

- Product trade name
- Names and concentrations of all active nutritional constituents (% w/v for liquids; % w/w for solids)
- Targeted crop(s)
- Method, dose, timing, and frequency of application
- Product registration number (Government of Nepal)
- Manufacturer name, address, and (for imports) distributor name and address
- Production date (manufacture date)
- Expiry date / shelf life
- Net quantity or volume
- Maximum retail price (MRP) per unit

- Toxic/hazardous elements (if any) and relevant safety warnings
- Storage and handling precautions

Labels must be in Nepali (Devanagari script) or English. The team also recommends that products containing chemical nutrients must not be labeled or marketed as 'biofertilizers' or 'organic fertilizers', as this constitutes misleading consumer communication.

3.5 Discussion: Regulatory implications

The five-year market trend data presented here reveal a loophole in regulatory system. The near-total collapse in the approved-product rate—from 20% of micronutrient products in 2019 to 0.9% of all specialty products in 2024—is not a reflection of worsening product quality per se, but of market growth dramatically outpacing legal frameworks. This pattern is not unique to Nepal: Paudel and Crago (2018) have documented how fertilizer subsidy policies in Nepal crowded out private sector importers of primary NPK but inadvertently opened space for an unregulated specialty input market. Amgain et al. (2017) similarly noted the absence of effective governance for organic and biofertilizer inputs. With the federalization, the Government has authorized provincial government for market inspection and weak market inspection is one reason for this unregistered products trading.

The domestic manufacturing sector, while currently operating informally, should be viewed as an asset rather than a liability. Facility visits confirmed that several companies possess genuine formulation capability with in-house chemistry expertise. A well-designed registration system with clear specifications could incentivize these companies to formalize, invest in quality assurance, and expand—creating a domestic specialty fertilizer industry that reduces import dependence over time.

4. CONCLUSION

Nepal's specialty agricultural input market has expanded nearly threefold in five years, growing from 78 to 218 products in the Kathmandu Valley between 2019 and 2024. Micronutrient fertilizers now constitute the dominant category (>60% of products), liquid formulations account for 87% of the market, and source countries have multiplied from 3 to at least 6. Yet regulatory oversight has deteriorated markedly: only 0.9% of surveyed products carry government approval, compared to 20% of the narrower micronutrient category in 2019, and 18% of products lack basic nutrient content information on their labels.

This paper has presented a longitudinal market trend analysis of specialty agricultural inputs in Nepal alongside internationally benchmarked product specifications. The proposed classification framework—seven liquid fertilizer categories and six solid fertilizer categories with defined minimum nutrient content thresholds—provides policy makers an evidence-based, actionable foundation for bringing this rapidly growing market segment under legal governance.

RECOMMENDATIONS

4.1 Amendment of Fertilizer Control Order 2055

The most urgent action required is amendment of the Fertilizer Control Order 2055 to explicitly include mixed chemical liquid fertilizers, mixed micronutrient fertilizers, and related specialty inputs within its scope. The amendment should incorporate the classification system and minimum nutrient specifications proposed in Tables 2 and 3.

4.2 Registration system activation

Upon amendment, MoALD should issue a transition period of six months during which existing products in the market must submit registration applications. Applications should require: laboratory analysis reports from accredited laboratories confirming compliance

with minimum specifications; manufacturer authorization documents from country of origin; complete label drafts; and safety data sheets for products with hazardous constituents.

4.3 Strengthening analytical laboratory capacity

Nepal's Central Agricultural Laboratory (CAL) and NARC/NSSRC laboratories should be prioritized for investment in multi-element analysis capability—particularly inductively coupled plasma optical emission spectrometry (ICP-OES)—to enable efficient pre-market and

post-market testing of micronutrient products. Accreditation to selected private laboratories having standard infrastructure and facilities should also be pursued to distribute the testing burden.

4.4 Market enforcement

Post-enactment, the Department of Agriculture's fertilizer inspection personnel should be empowered and resourced to conduct regular market surveillance, with provisions for product seizure, importer suspension, and financial penalties for non-compliance.

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